ENGINEERING LITERATURE

Supplement to ENGINEERING NEWS. 220 Broadway, New York, December 15, 1910.

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EDITORIAL.

Why So Few Biographies of Engineers?

The really good biographies of engineers can be counted on one's fingers, and if the commonplace biographies were added all of the fingers of a second person would scarcely be required. Of course we refer to biographies in the English language, and to those which are more than brief sketches, essentially in magazine or cyclopedia form. All things considered, probably Smiles' "Lives of the Engineers" still affords the most satisfactory examples of fairly extended engineering biography, notwithstanding the fact that the biographies deal with past generations of British engineers and were written by a man without engineering training. The new life of Edison, reviewed elsewhere in this issue, is a noteworthy biography, but Edison is an inventor rather than an engineer. The time is ripe for a considerable number of additional biographies of engineers. The task, or tasks, might worthily engage the attention of some of our engineers and engineering professors possessed of literary ability in general and biographical skill in particular. Who will be the first in the field?

CORRESPONDENCE.

On Making a Card Index.

Sir: In your issue of Nov. 17, 1910, I note a valuable editorial on the use of a personal card index. Having kept one myself since leaving college, I am much interested in the opinions and methods of others. I note, however, that you recommend that a man index his own library and also those articles in books and periodicals which may bear directly on his branch of the profession.

This seems to me to be of doubtful value to the average engineer except in special instances. Few engineers have such a large library that they do not know in what books to look for what they may want, unless it is something unusual. With the book in hand, its own index is nearly as good as the cards, and much labor of copying is avoided. Concerning other books and periodicals, how many engineers have access, at all times, to up-to-date reference libraries covering their own particular line of work? The usual public library is worse than useless for such purpose, except that it may contain bound volumes of some of the leading journals. For these the published indexes serve well enough.

Supposing a young engineer in a large city does spend considerable time in reading and indexing the current literature which he thinks will be of service to him. Shortly after, he moves to some small town or perhaps out on some large construction work. Of what use is his index if he cannot get at the things to which it refers? Generally he does not know for several years just what branch of the profession he will eventually follow. Therefore, many of the references taken during that time would be of little benefit beyond the experience and general training.

The writer has threshed out these questions in his own mind and has come to the conclusion that a letter file along with the card index is the only reliable way. By this I mean the standard manila folders used in a drawer file. From the periodicals, as received, the writer cuts out the articles thought to be of value. These are indexed and filed in a folder covering a general head rather than a separate one. This reduces the amount of dead paper and makes several similar articles available at once. As one folder becomes too bulky, it may be split into sub-divisions and re-indexed. Articles in papers for which one does not subscribe may often repay copying or purchase of that particular number.

The cards are cross indexed, in part, as thought necessary. If this is omitted, one's mode of thinking may change toward a subject, during the interim between records, and cause confusion. Cards or articles that have become obsolete, or not pertinent, may be culled at any time with an exact knowledge of what is being thrown away. The cards used are blank, though a standard form of heading is used. In each case the card should show from what the information was taken and on what date it was printed.

This method of indexing obviates the necessity of keeping bundles of back numbers which are never reread or can never be found when wanted. The file takes up but little room, considering the amount of information it contains, and can usually be kept in the double drawer of a desk to good advantage. It saves the things you want and keeps them under your hand in a live way.

Yours very truly,

W. B. Rawson, M. E.

York, Pa., Nov. 23, 1910.

[In the editorial referred to above, we did not by any means intend to infer that a card index was to replace or duplicate the published indexes of the engineer's own library; but that it was to be a supplement to such indexes on subjects in which the engineer was most interested.

An illustration will perhaps make our meaning clearer. Suppose one is particularly interested in air compressors and compressed-air work. In reading a descriptive article of a certain drawbridge, he comes across a column of interesting facts on the air-compressor plant used. He will be most interested in this part of the article and will doubtless remember for a long time that in some description of a drawbridge foundation, he had read something important on air-compressor plants; but he may forget the paper, the date, the name of the bridge, and all else that would identify it.

Suppose he had made out a card, Air compressors, see such a paper, date, page, etc. Would it not save him hours of useless labor in hunting through a score of articles on drawbridges to find that particular description? For the chances are very slim that the published index would have a reference to the article under air-compressors, since the main part of it concerned only drawbridges or foundations. Supposing he did not have the files of the paper to hunt through and wished to send for a copy containing this article. Has he any means at all of knowing what copy he wants or giving directions to another to find that copy?

The same argument applies to indexing certain items in the books of one's own library. There are, of course, indirect ways of finding the place in the book that you want, but isn't this sometimes a longer process than writing an index card?

It is true that a young engineer or engineering student often does not know what his future work will be, but we do not believe that this is a valid argument against his keeping an index of some branch that interests him for the time being.

The habit thus acquired of reading and selecting will certainly repay him, and it may actually point the way to his ultimate life work. Our cautions against indexing too much arose, not from a fear that he would index more than he could use, but because the tremendous labor involved in keeping up such a broad index would discourage the indexer before he had gone very far, and because published indexes can be made to answer for general purposes.—Ed.]

REVIEWS.

Railroad Surveying.

Reviewed by F. LAVIS.* M. Am. Soc. C. E.

RAILROAD FIELD GEOMETRY.—By William G. Raymond, C. E., L. L. D., Professor of Civil Engineering and Dean of the College of Applied Science, State University of Iowa. First edition. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Flexible morocco; 4¼ × 7 ins.; pp. 246; 18 plates and 107 text illustrations. $2. net.

TRACK FORMULAE AND TABLES.—A Handbook of the Theory and Practice of Turnouts and Track Connections. By Shelby Saufley Roberts, M. Am. Soc. C. E. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Cloth; 4 × 7½ ins.; pp. 514; 101 illustrations in text; 61 tables. $3. net.

At first sight one is inclined to wonder at the appearance of another "Field Book" on Railroad Surveying. Prof. Raymond, however, states in the preface "that this is not a manual of practice, or a treatise, but intended only for use as a textbook for students and published in pocket-book form simply for convenient handling in classroom and field."

The book is devoted to the explanation of such problems in surveying as usually occur in connection with surveys of the center line of steam railroads, laid out according to American practice, and in staking out earthwork and calculating the quantities in ordinary cuttings and embankments. This is, of course, all old, but the author finds the usual text-books inadequate for the use of his classes and has presented the matter in a way which he thinks will make it more easily understood by his students.

About one-half of the book is devoted to the solution of specific problems relating to curves, spirals, turnouts, etc., each problem leading to the development of one or more equations, of which there are altogether 191, which are numbered, in these sections. In stating the various problems, in working them out, and in the introductory chapter, the author has been at considerable pains to endeavor to explain the subject in such a way that it may be understood by beginners wholly unfamiliar with railroad surveying but who are presumed to have a fair knowledge of ordinary surveying.

There are some statements made with which the majority of railroad engineers will not agree. The author states his preference for a definition of the degree of curves based on the number of degrees subtended by an arc of 100 ft. rather than by a chord of that length. This has been discussed for many years, but the large majority of railroad engineers apparently refuse to be convinced either of its utility or any real advantages it may have. The statement is made that, if the speed permits, curves of shorter radius may be used, "and will be cheaper [to operate] for a given central angle than [curves)] of a less degree, since there will be less curved track to maintain, though actually more total feet of track." It would be interesting to know on what facts this statement is based.

In describing the preliminary survey, the author states "That a profile is made of the preliminary line" [an ordinary angle line having previously been described]. "That a grade line is drawn on this profile, *for the purpose of making a preliminary estimate of the quantity of earth to be moved, the height and length of bridges, etc.*" This, while only too true in many cases, is very bad practice.

There are some minor matters which would not call for note except in a book written by a Professor of Engineering for the use of students; as for instance the use of the word chain, with

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the implication that the use of the chain is good practice; tape-line instead of tape savors more of the layman than the engineer. There is a chapter entitled "Canting the Track" which refers to the elevation of the outer rail on curves. Adjoining curves in opposite directions are spoken of as "reverse" curves in the text and in the index as "reversed" curves, etc.

As noted above, the larger part of the book is devoted to the solution of curve problems and the development of many equations. The writer (of this review) has no practical knowledge of the difficulties of teaching or of those encountered in determining the best training for engineering students, but from his experience with not a few young men who have found their way out "on the turf" after leaving college he is inclined to think that the great lack in their training, in so far as the solution of curve problems (or for that matter any problems of surveying) is concerned, is that they think each problem is essentially different from every other, and that unless they can remember the particular solution in some particular book, and the particular equation there worked out, they are lost. It has always seemed to him that if students could in some way or other have the essential principles hammered into them, and most particularly those of plane trigonometry and enough geometry so that the solution of plane triangles was as easy and familiar as the multiplication table, there would be little use for "*Field*" books with examples of every problem likely to come up. It is not intended to criticize the matter contained in this little book or the manner of its presentation, except in so far as the title and make-up may lead to the assumption that such a book is needed in the field. All that is, or should be, really necessary in the field is a book of tables similar to those at the end of "Searles" or "Webb," with possibly some slight modifications or additions, and if such a book in convenient form were available it would be most welcome. No tables of any kind are included in Professor Raymond's book which, therefore, is of no use in the "Field" without another book containing them. From the writer's point of view such a book as the one under consideration is only suitable for the class-room, as it seems to him that that is the place where *methods of solving* problems in geometry should be taught, and even there such a book as this must surely tend to give students the impression that all these curve problems are essentially different and require special solutions, rather than being practically all simply variations of the same old story.

There are chapters describing methods of Staking Out (earthwork), Computations of Quantities, Calculation of Earthwork Tables, The Construction of Diagrams (relating to earthwork computations), Overhaul, Mass Diagrams, and Right-of-Way Descriptions. All these subjects are well covered and the matter clearly set forth, but there is nothing new. The last three chapters mentioned have much good information in convenient form, and are illustrated by diagrams apparently taken from actual records and representing modern practice.

In "Track Formulae and Tables," Prof. Roberts has made a collection of most of the various typical combinations of simple curves and straight lines which are met with in connection with laying out railroad tracks, and has shown in detail, in the first third of his book, how, with certain elements given, the various unknown quantities may be calculated. As exercises for students of geometry these examples will prove of much interest, and doubtless of quite as great value as many others of the same kind to be found elsewhere is the numerous text-books and so-called field books covering the same subject. The writer does not understand why different exercises of this nature should be required in different colleges and technical schools, but there is doubtless a good reason.

In working out these exercises, which in each case the author does in detail, giving this part of the book the appearance of some abstruse work in mathematics, it is assumed that the switch and frog rails are tangents, connected by suitable curves. He states that the principles advocated have been "found to give results, which, when expressed in 'hubs' on the ground, are capable of being followed by track foremen, to obtain track connections that fit without fudging."

The writer has yet to find any so-called track problems (except occasionally as a matter of convenience in connection with spirals) where anything more than a little horse sense, some practical experience, and a good working knowledge of plane geometry and trigonometry were needed in order to get things right, and is firmly convinced that the presentation of these problems as track problems rather than as exercises in geometry is distinctly detrimental to the student. To the practising engineer, of course, a book of track problems worked out theoretically is of no possible use, as aside from the geometrical construction, the method by which he attacks the actual working out of the problem is entirely different. As for setting stakes or hubs for track there is nothing in this book which will help anyone who has not had other experience of a practical nature. The reflection, which by inference at least, the author casts on the railroad engineers of the country, that, as a general thing, they cannot or do not lay out tracks without making it necessary for the trackmen to "fudge" is, of course, nonsense.

The book contains a collection of tables for use in track work which is quite complete, many of them being quite new so far as the writer knows and which can be used to advantage in avoiding some calculations in the field when it is necessary to stake out track connections which have not previously been calculated in the office, and even there some routine calculations may be avoided by their use, provided the standards of the American Railway Engineering & Maintenance of Way Association are followed. Those of the tables original with the author occupy some 70 pages, or about one-seventh of the book, the remainder, about one-half of it, being occupied by tables, etc., compiled from various sources, and include several tables of track data, as proposed by the American Railway Engineering & Maintenance of Way Association, the tables of logarithms of numbers and of the functions of circular curves, both logarithmic and natural, reprinted from "Allen," part of Butts' curve tables, Trautwine's table of Circular Arcs, etc. Prof. Raymond is freely quoted in various parts of the book.

In addition to the above there are several pages of scraps and items of information on topics wholly unrelated to the general subject matter of the book as indicated by its title. These are presented much in the same way as one would jot down a memorandum in one's own private note-book, and which while intelligible when one has a good general knowledge of the subject or the circumstances under which the note was made, are not to be indiscriminately used by persons without this knowledge. These notes refer to bridge weights, concrete, curve compensation, foundations, locomotive rating, train resistance, rail sections, right-of-way, etc.

Aside from the 75 pages of Track Tables the writer sees very little reason for the publication of this book, and even in regard to the track tables, most railroads have these prepared to suit their own practice and insist on their use. So far as may be seen without a detailed critical examination, the principles advocated and methods of solution adopted are correct, as indeed they should be, as they are, generally, based on the recommended practice of the American Railway Engineering & Maintenance of Way Association.

NATIONAL LUMBER MANUFACTURERS' ASSOCIATION.—Official Report of the Annual Convention held in New Orleans, La., April 19-20, 1910. Chicago, Ill.: The Association (Leonard Bronson, Mgr., Fisher Bldg.) Cloth; 6 × 9¼ ins.; pp. 269. 50 cts.

Judging from a statement by the association named above the publication of its annual proceedings is a new departure. The contents of the volume before us are of such a character as to warrant the step taken to make them available "to libraries in the United States, to public officials having to do with forestry matters," and to other interested persons. The nominal price placed upon the volume should encourage its purchase by a large and increasing number of people who are giving attention to the raising and utilization of forest products.

Many of the subjects discussed at the convention are of broad appeal to both those interested in forestry and in public and private economics. Besides reports of officers and numerous affiliated associations representing various sections of the country, the volume contains a valuable discussion of "Timber and Taxation," by Prof. F. R. Fairchild; an interesting paper on "The Problem of Private Forestry," by Henry Solon Graves, Chief of the U. S. Forest Service; "Utilization of Waste in Forest and Mill," by Capt. J. B. White; "Forest Fire Prevention and Control," by E. T. Allen; "Future of Stumpage and Lumber Values," by James D. Lacey, and a number of other papers dealing with such topics as Uniform Inspection of Lumber, Insurance, Lumber Trade Ethics and Freight Classification.

It is interesting to note that all of the speakers at the convention who referred to the forestry work of the general and the state governments seemed to be in hearty sympathy with the work for the nation and states alike and that nothing but praise for the way the U. S. Forest Service has been conducted by both ex-Chief Pinchot and present-Chief Graves was heard.

Insects and Disease.

INSECTS AND DISEASE.—A Popular Account of the Way in Which Insects May Spread or Cause Some of Our Common Diseases. By Rennie W. Doane, A. B., Assistant Professor of Entomology, Leland Stanford Junior University. New York: Henry Holt & Co. Cloth; 5¼ × 8 ins.; pp. 227; 112 illustrations in the text. $1.50, net; by mail, $1.62.

An idea of the general plan and scope of the book may best be given by a brief quotation from the preface:

> This little book is an attempt to bring together and place in untechnical form the most important of these facts gathered from sources many of which are at present inaccessible to the present reader, perhaps even to many physicians and entomologists.
>
> In order that the reader, who is not a specialist in medicine or entomology, may more readily understand the intimate biological relations of the animals and parasites to be discussed it seems desirable to call attention first to their systematic relations and to review some of the important general facts in regard to their structure and life-history. This, it is believed, will make even the most complex special interrelations of some of these organisms readily understandable by all. Those who are already more or less familiar with these things may find the bibliography of use for more extended reading.

The author briefly takes up "Parasitism and Disease" and "Bacteria and Protozoa." He then has a short chapter on "Ticks and Mites," with particular relation to Texas fever in cattle and Rocky Mountain spotted fever and relapsing fever. He then proceeds with an exposition of "How Insects Cause or Carry Diseases."

A relatively brief chapter suffices for house-flies. Three chapters are given to mosquitoes; one dealing with these insects in general, and a second and third with their relations to malaria and yellow fever, respectively. In the ninth chapter "Fleas and Plague" are considered. The final chapter is devoted to a variety of "Other Diseases, Mostly Tropical, Known or Thought to be Transmitted by Insects." Finally, about 45 pages are given up to a well-classified bibliography which, while it does not aim at completeness, is more than sufficient for most of the probable readers of the book. The fact that so much space is required for a partial bibliography of the subject cannot fail to impress a thinking person with the importance of insects in their relation to disease.

The volume is distinguished from most other popular books on the same general subject by its fuller treatment of the life history of the various insects, in so far as this contributes toward an understanding of the main subject. Technicalities are avoided so far as possible, and in general the language and treatment is simple and the book well within the grasp of persons of average intelligence, even though they have practically no knowledge of entomology on

the one hand, or medical phases of communicable diseases on the other. The book should serve a useful purpose as a contribution to the educational work which must be done in order to give the general public the understanding of the causes and the modes of prevention of the spread of communicable diseases which is essential to the highest success of the present widespread health campaign.

Peary's Conquest of the Pole.

THE NORTH POLE.—Its Discovery in 1909 Under the Auspices of the Peary Arctic Club. By Robert E. Peary, with an Introduction by Theodore Roosevelt and a Foreword by Gilbert H. Grosvenor, Director and Editor, National Geographic Society. New York: Frederick A. Stokes Co. Cloth; 6¾ x 9¾ ins.; pp. 373; 1 map, 8 plates and 100 text illustrations. $4.80, net.

It is hard to imagine any one who would not be interested in this readable account of Peary's final and successful attempt to reach the North Pole. Every page is full of interest, but chiefly of what may be termed human rather than scientific interest, for the volume as a whole contains a very small amount of scientific information.

As the title page indicates, the volume opens with an introduction and a foreword from other pens than that of the author. The "introduction" consists of a page of appreciation of our author and explorer. The foreword, of some fifteen pages, is a condensed and interesting historical review of arctic exploration during the past 400 years.

Peary's narrative begins with an outline of his plan for what he knew must be his final attempt to reach the Pole and what he believed would be a successful endeavor. The plan included the utilization of the Smith Sound, or American, route; the selection of a winter base at Cape Sheridan; the use of sledges and eskimo dogs; and "the use of the hyperborean aborigine (the Whale Sound eskimo) as the rank and file of the sledge party." In addition, it included a company of picked men for the more immediate assistants and the crew of the "Roosevelt," and a close following of the lessons of experience taught by Peary's three previous efforts to reach the Pole and his earlier experiences in Greenland, altogether comprising more than two score years of arctic explorations. The plan was carried out without a break and had nothing whatever to mar it except the lamented loss of Ross T. Marvin, of the College of Civil Engineering, Cornell University, who served as secretary and assistant to Commander Peary.

The second chapter deals with preparations for the fourth and successful expedition. This included, first and foremost, the raising of necessary funds and the overhauling and refitting of the "Roosevelt," which boat, it is hardly necessary to say, was used on the third expedition. The really difficult and trying part of the expedition, it appears, was raising the necessary money essential for its success.

The main outlines of Peary's trip to the Pole and back are too familiar to make it necessary to attempt to give any detailed account of the contents of the volume, which is devoted to a narrative of the journey, in which are interspersed chapters devoted to the eskimos and their customs, big game in the arctic regions, etc., all of which are really so closely related to the journey as to make anything said regarding them almost an essential part of the story. Naturally, the main interest centers in the sledge trip to the Pole and back from the winter quarters at Cape Sheridan; but only of secondary interest is the account of the fight with the ice before Cape Sheridan was reached, and almost equal to this last in interest is the description of winter quarters at Cape Sheridan, the hunting and other work essential to the main object of the expedition and the experiences during the "Long Night."

As we have already stated, Peary's narrative contains comparatively little information of a directly scientific character, and most of that is put in popular form. A small amount of scientific information is given in an appendix of a dozen pages entitled "Summary of Bathymetrical, Tidal and Meteorological Observations," by R. A. Harris, Coast and Geodetic Survey, Washington, D. C. Another appendix gives facsimiles of original astronomical observations by Peary and two of his associates near and at the Pole. A third appendix gives the Report of the Sub-Committee of the National Geographical Society on Peary's records, followed by a list of "some of the honors awarded for the attainment of the Pole." An index concludes the volume.

Inasmuch as the aim of the author appears to have been to produce as popular and readable a story of his expedition as was possible, there is little occasion here to enter into any criticism of the book. However, the book affords little answer to a question so often raised—whether, sentiment aside, it has really been worth while to spend so much money and physical and nervous energy as have been lavished by Peary and others in their attempts to reach the Pole. So far as the present volume is concerned, the answer would seem to be "No," but an altogether different answer may perhaps be given when the scientific records of the expedition are reduced to useble from and made public.

The many half-tone engravings with which the volume abounds add greatly to its interest and somewhat to its usefulness. Even though the book was designed almost wholly for popular reading, one might reasonably expect more in the way of maps than is given. There are only two maps; one, a small-scale "stellar projection," showing the relation of the Polar Sea to the various continents and the route of the expedition, and the other, a folding map about 17 ins. square, showing various explorations "towards the North Pole," together with the route of Peary's successful trip. At various points in the text, the reader would have been greatly helped by the inclusion of sketch maps, and also of diagrams and sketches illustrating such points as the construction of the sledges and the harnessing of the dogs. Some of these things are rather laboriously described in words which, certainly, the popular class of readers, for whom the volume was intended, could be expected to follow only with difficulty, whereas a child could have understood sketches which might easily have been prepared and inserted. To some extent, the photographs make up for the lack of sketches.

Finally, as we have already intimated, we do not think that Commander Peary will have done either himself or his subject justice until he has written and published an altogether different record of this successful trip to the Pole. As he is still a comparatively young man, it is reasonable to hope that he will yet write an adequate record of this and his previous explorations, not necessarily omitting any of the interesting descriptions of the human beings and other inhabitants of the Far North, but not failing to give a full account of everything else done and seen which is of value and interest to the explorer or the scientist. Even in the way of popular literature, it would seem to be a pity to have the present book go down through future generations as the final word on Peary's conquest of the Pole.

Johnson's Surveying.

THE THEORY AND PRACTICE OF SURVEYING.—Designed for the Use of Surveyors and Engineers Generally, but Especially for the Use of Students in Engineering. By J. B. Johnson, C. E., late Dean of the College of Mechanics and Engineering of the University of Wisconsin. Seventeenth edition, rewritten. By Leonard S. Smith, C. E., Associate Professor of Topographic and Geodetic Engineering, University of Wisconsin. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Cloth; 5¼ x 8¼ ins.; pp. 921; 7 plates; 13 tables; 260 text illustrations and 9 appendices. $3.50, net.

It is now some 24 years since the first edition of Prof. J. B. Johnson's standard work on "The Theory and Practice of Surveying" was published. In that time it has gone through 17 editions and has reached an issue of 37,000, a proof in itself of the popularity and worth of the book. The first sixteen of these editions were under the care of Prof. Johnson himself, but since his untimely death in 1902 there has been no effort to continue his work until the present edition was taken up by his colleague at the University of Wisconsin, who has made probably the most complete revision the book has had since its initial writing.

The large part of the book has been rewritten and revision has taken the following form: (1) rearrangement of the subject matter; (2) omission of certain portions, notably the chapters on "Railroad Topography"; (3) addition of a number of illustrations and of 100 pages of text; (4) rewriting of chapters on the engineer's level and transit, and on land, topographic, hydrographic, city and geodetic surveying, and (5) the addition at the end of each chapter of a bibliography of the subject treated therein. It will be noted that this involves extensive changes, but the original purpose and scheme of the book are scrupulously adhered to and the rule seems to have been solely to make the treatment up to date.

Workingmen's Insurance in Ten European Countries.

WORKINGMEN'S INSURANCE IN EUROPE.—By Lee K. Frankel and Miles M. Dawson, with the cooperation of Louis I. Dublin. New York: Charities Publication Committee. Cloth; 6 x 9¼ ins.; pp. 477; 145 tables. $2.50, net; by mail, $2.70.

The widespread attention now being given to the welfare of industrial workers in the United States, and particularly to safeguards against individual or family disasters due to accident, sickness or death, makes this volume very timely. The book is based largely on recent personal investigations made in Europe during a period of six months. The countries visited and reported on were Great Britain, Norway, Sweden, Denmark, Holland, Belgium, France, Switzerland, Italy, Germany and Austria.

Four main sections deal successively with insurance against: (1) industrial accidents, (2) sickness and death, (3) invalidity and old age and (4) unemployment, and a fifth section takes up "complete insurance systems." The aim of the latter is to safeguard the insured against the various risks just named, and to do it in such a way that there is no overlapping or conflict, such as occurs when the different risks are handled separately. Under the various sections named, sub-divisions of the general subject are considered. Thus, under industrial accidents we find, first, something on employers' liability, then insurance of or by employers in private companies, insurance in mutual associations and in government departments, followed by specific information on compensation and accident insurance practice in various European countries visited.

Four appendixes give summaries of the laws, institutions and administration of workingmen's insurance systems in Europe; costs and benefits of such insurance in Germany for the year 1907, and various statistics of accident insurance in Switzerland in 1907. The fourth appendix is a table of foreign money values. A brief but useful bibliography and a full index complete the volume.

The book as a whole appears to be a very complete and thoroughgoing study of the subjects treated. It contains a considerable amount of useful statistical matter, but the statistics are not at all burdensome. Critical comment adds to the value of the book, which promises to be very useful at this particular juncture. How eagerly such information as the book contains is being sought is indicated in part by the fact that, according to the Foreword, "eight states have appointed official commissions to study the subject and report plans for adoption." We hardly need add that the book is a worthy addition to the valuable series heretofore published by the Russell Sage Foundation.

CONCRETE WORKER'S REFERENCE BOOKS.—By A. A. Houghton, Author of "Concrete from Sand Molds," "Ornamental Concrete Without Molds," Etc. No. 1: Concrete Wall Forms. No. II.: Concrete Floors and Sidewalks. New York: The Norman W. Henley Publishing Co. Stiff paper; 5 x 7¼ ins.; pp. 62 + 23, 63 + 23; 16 and 8 illustrations in the text. 50 cts. each.

The two books noted above are the latest additions to the series which Mr. Houghton is writing and which, when completed, will comprise a popular library on all of the minor branches of concrete construction. There are a great number of amateur builders, practising only with their

own funds and upon their own property, and of small contractors, who are much interested in the craftsman's details of concrete work and who do not need or cannot comprehend the technical literature of the subject. For them, the popular treatment of these "Concrete Worker's Reference Books" should be just what is needed. The language is clear and the practical hints most valuable. It would have been better had the author left out of his suggested designs, are not for the amateur or the beginner.

Electrical Books.

Reviewed by HENRY H. NORRIS.*

THE TESLA HIGH-FREQUENCY COIL.—Its Construction and Uses. By George F. Haller and Elmer Tiling Cunningham. New York: D. Van Nostrand Co. Cloth; 5¼ × 8 ins.; pp. 119; 7 plates and 49 text illustrations. $1.25, net.

DYNAMO ELECTRIC MACHINERY: ITS CONSTRUCTION DESIGN AND OPERATION.—Direct-Current Machines. By Samuel Sheldon, A. M., PH. D., D. Sc., and Erich Hausmann, E. E., M. S. Eighth edition, completely rewritten. New York: D. Van Nostrand Company. Cloth; 5¼ × 7¾ ins.; pp. 328; 210 text illustrations. $2.50, net.

ELECTRICITY EXPERIMENTALLY AND PRACTICALLY APPLIED.—Principles, Experiments, Practical Applications and Problems. A Book for the Beginner and for the Practical Man. By Sidney Whitmore Ashe, B. S., F. E.; Author of "Electric Railways." New York: D. Van Nostrand Co. Cloth; 5¼ × 7¾ ins.; pp. 340; 422 text illustrations. $2, net.

Mr. Tesla's famous high-frequency experiments of more than twenty years ago aroused much interest at the time but the results were of scientific rather than practical value. His hopes of power transmission by means of high-frequency currents were not realized, but in recent years wireless telegraphy and telephony have opened up a wide field of usefulness for such currents. The term "high frequency" is used to distinguish between the ordinary commercial power and lighting frequencies of from 25 to 60 cycles per second and those used for intelligence transmission which may be 50,000 cycles per second or more. At the high frequencies the effects of inductance and capacity in the circuits become very great and the phenomena are therefore quite different from those of low frequency circuits. Very spectacular experiments may be performed with high-frequency currents, particularly because these currents may be caused to flow through the human body without danger. Very high voltages, a million for example, may be safely handled. This is due largely to the fact that the current flows on the surface of the body and hence does not affect the vital organs. A favorite experiment consists in placing one hand on a terminal of a high-frequency, high-voltage transformer and holding an incandescent lamp by the base in the other hand. The current flows through the experimenter's body, through the lamp, the lamp vacuum, the glass bulb, and the surrounding space to the other transformer terminal. The lamp is lighted without unpleasant sensation in the experimenter's body. Such sensational experiments have become peculiar in vaudeville shows where they effectively astonish the public.

In view of the popular interest in high-frequency currents it is likely that many amateurs would like to have specific instructions regarding the constructions of the necessary apparatus. Messrs. Haller and Cunningham have tried to meet this supposed need. They give detailed directions, with all necessary dimensions for all parts of the apparatus. To follow these instructions will require considerable mechanical skill, but the authors state that the amateur can construct the coils and transformer with very slight expense, making no allowance for the value of his labor. As they have actually constructed and tested the apparatus which they describe it will undoubtedly operate as claimed. The treatment of the subject is simple and informal and gives the impression that the writers know what they are talking about.

In the few years during which "Dynamo Electric Machinery" has been on the market eight editions have been called for. This is good evidence that a need has been met by its publication. It contains descriptions of direct-current apparatus with such theory as appears necessary to render its operation intelligible to a beginner. The authors state that the point of view from which the book has been prepared has not changed since the first edition was printed. The purpose has been "the production of a text-book for the use of students pursuing electrical or non-electrical engineering courses." The eighth edition has been largely rewritten and a number of important changes have been made. The chapters on design and testing have been omitted and a number of new topics have been treated. Among these are the theory of commutation, means for the predetermination of the operating characteristics of direct-current generators and motors, and the discussion of costs, prices and operating expenses. A list of problems has also been appended to each chapter.

Dr. Sheldon's standing as a teacher and electrical engineer gives assurance of the reliability of the data and descriptions of current practice and of the accuracy of the analysis. The clear style of the composition is also evidence of long experience in putting thoughts into convincing statements. In reviewing the volume on direct-current dynamo electric machinery, therefore, it is unnecessary to take up these points. Attention will be devoted more to the contents and to the general plan. The criticisms which follow are intended as constructive suggestions and are not made in a fault-finding spirit.

The authors have evidently been confronted by the difficulty of deciding how far to go in the matter of detail. With the large scope and small compass condensation was necessary. The style of the writing is therefore compact, a great deal of information being contained in each paragraph. The sentences are clear cut and definite but on account of the condensation they state their messages in many cases merely in outline. The reader must have some other sources of information in order to enable him to follow out the suggested lines of thought. These sources are presumably the laboratory and class-room exercises. As an illustration of this point we may cite a few sentences from the section on armature coils:

> In multipolar armatures the windings consist of a number of similar and interchangeable *formed coils*, which are wound on separate collapsible forming blocks. The several conductors that constitute one coil are insulated individually and are fastened together and wrapped with a few layers of insulating tape. For this purpose cotton or linen tape, varnished cloth or paper, or micanite are generally used. The advantage of formed coils is their superior insulation and the facility with which damaged or burned-out coils can be removed without disturbing the other coils.

These sentences, excellent in themselves, are so condensed that unless the reader knows more than he can get directly from them, they can only be partly understood. A reader, new to the subject will ask himself: What are "formed" coils? What are "forming" blocks? How can blocks be collapsible? Why should they be collapsible? Are individual conductors wound with tape or micanite? What is micanite? Is more than one kind of tape used on a coil? Why have formed coils superior insulation? Why are formed coils easier to remove than other coils? What other kinds of coils are there? etc. Of course, the purpose of instruction is to stimulate just such questions as these. If, therefore, the reader is in a position to have his questions answered either by his own observation or by an instructor, and *if he does so*, he is undoubtedly better off than if the text had been very explicit.

The order in which the authors have arranged their material both in a whole and in individual chapters does not seem to accord with the pedagogical maxims, "facts before definitions," "the particular before the general," etc. For example, the topics are treated in this order: armatures, field magnets, armature reaction, commutation, and last of all, generators and motors. In describing a machine it would seem natural to show first the machine itself rather than a detail. Similarly, a particular machine would be shown and the parts of this machine would be described. Generalization would come later. The same criticism applies to the arrangement of the material in each chapter. For example, under "armatures" we find, first, the complete theory of e. m. f. generation, before the reader knows what an armature is. Then comes a discussion of armature coils, the coils used in the theoretical part being "open" coils which are not used in practice to any extent. Finally the armature itself emerges in the same manner as do the generator and motor near the end of the book. If the reviewer's conclusions are correct the book should be read from the back forward.

The authors have acted wisely in cutting out design and test material and this process can be carried still farther, leaving room for greater elaboration in descriptive parts. There is still much which savors of design and which is therefore beyond the reach of the average undergraduate. The rather elaborate treatment of armature reaction and commutation is out of proportion. Such matters can only be understood by advanced students and designers and then the analysis must be carried much farther. It would seem also that the 20 pages given to the constant current generator are excessive in view of the relative importance of this type of machine. It is obviously impossible in 322 medium-sized pages to give the fundamental electrical and magnetic laws, the principles of design and operation as well as the construction of generators, motors, controllers, etc., and the advanced theory at the same time.

Mr. Ashe has made a specialty of delivering courses of lectures to the employes of electric railway and lighting companies. As a result he has learned how to explain electrical and magnetic phenomena to practical men, untrained, as a rule, in science and mathematics. His purpose in these lectures has been to connect the instruction in electricity and magnetism with the every-day life of the men. The same purpose is evident in his new work on electricity, in the manner of presentation of the material. As the lectures, upon which this book is evidently based, were in many cases delivered at night, they had to be interesting to keep the hearers awake. The principal factor in stimulating and maintaining their interest was the use of experimental demonstrations with simple but practical apparatus. These experiments, 172 in number, cover the entire range of electrical applications. Many of them can be repeated with the simplest equipment. Naturally in a book of this kind, illustrations predominate. There are 422, or nearly 1¼ per page. At the end of each chapter is a list of questions which aim to bring out not merely the facts described but also to stimulate the judgment of the reader.

The list of subjects covered, as indicated by the chapter headings, is as follows: Magnetism, Electro-magnetism, Electro-magnetic Induction, Theory of the Dynamo, Ohm's Law, Primary and Storage Batteries, Electrolysis, The Three-Wire System, Electrical Measurements, The Shunt Motor, The Series Motor, The Arc Light, Incandescent Illuminants, Recording Wattmeters and Their Use, Elementary Principles of Alternating Currents, The Alternating-Current Transformer, The Induction Motor, and The Rotary Converter. This is certainly a large program, particularly as no mathematics are used to shorten the discussion. With the very large number of topics to be treated but a small space can be given to each, hence the text is "choppy." The text is, however, assisted by the diagrams and half tones. The diagrams are very crudely drawn but they are fairly clear. The other illustrations are largely taken from the trade publications of electrical manufacturers.

The book should form a convenient reference text for use in "popular" lecture courses, in Y. M. C. A. classes, etc. Its method is practical rather than scientific. It is written in an informal style, such as would be used in a lecture. Persons who are called upon to give illustrated talks on electrical subjects before general audiences will find many interesting suggestions.

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The Story of the Steamship.

STEAM-SHIPS.—The Story of Their Development to the Present Day. By R. A. Fletcher. Philadelphia, Pa.: J. B. Lippincott Co. London, England: Sidgwick & Jackson, Ltd. Cloth; 7 × 10 ins.; pp. 421; 130 text illustrations. $3.75, net.

In this long but entirely interesting story of the steamship, Mr. Fletcher has collected some information which is not disclosed by reading the earlier similar works. In the description of the development of early English boats, the author shows us the details of construction, together with descriptions, photographs and drawings of machinery which we have not seen collected before, and which throw a little light on the development of the steamboat in England and its influence in America. When a description of the early American boats is taken up, naturally the author has not at hand the abundance of material which he has found in his own country. The 3,200 miles distance over seas shows its effect in the writing of a history like this, but the outline of the American development is entirely creditable and in accordance with the majority of compilations of records or pseudo-records. It could hardly have been expected that the author would have been able to collect and present quite as large an amount of American as British matter. The descriptions of these early attempts at steam navigation are accompanied by several reproductions from old engravings and drawings which are new to most American eyes. For instance, there is shown Hull's boat with stern paddles (1737). The engines of the pioneers, William Symington and Henry Bell, are shown by photographs of the original machines which have been preserved. After discussing the primitive experiments, the author describes the subsequent types of construction and development of service under the headings "Railway Companies' Steamships," "Transatlantic Service," "Development of the Steam Auxiliary," "Iron Shipbuilding," "Steam Power in the Navy" and "Miscellaneous Steam Vessels."

This "story" is more popular than technical, and doubtless it has been made so purposely. The general scheme of outlining a development of design, or the growth of an idea, seems to be by describing the activities of the several companies, following one company's history at a time. This is not without its advantages, though it keeps the reader's mind running back and forth between early and late dates.

The author credits the "Conde de Patmella" with being the first steamer to cross the Atlantic. It steamed from Lisbon to Brazil in 1820, the year following the memorable trip of the "Savannah" from New York to Liverpool. The "Savannah," however, was hardly more than a sailing vessel with a small steam auxiliary plant.

The rise of the various transatlantic companies is graphically told, though much engineering information can hardly be expected to be disclosed—especially about the several boats which steamed out on the Atlantic never to be heard from again. The other trans-oceanic concerns are not neglected by any means—especially those British interests maintaining services to the Orient.

Change from wood to iron is attributed to the tendency of larger deep-water vessels to "sag" or to "hog"—that is, to droop amidships or at the ends. This could not be corrected on deep-water steamers by the American scheme of using stump masts and tie rods, employed on river and coast vessels. The author denotes as the first iron vessel for commercial service as the "Vulcan," built near Glasgow in 1818. The credit of being the first iron steamer he gives to the "Aaron Manby," of Birmingham, built in 1821.

The development of engines, paddles and screws, is included in the discussion of experimental iron shipbuilding. For the practical form of the screw propellers, Col. John Stevens, of Hoboken, is given major credit. Here is also a long account of the design, equipment and service of the "Great Britain," the first ocean-going, screw-propeller steamer, launched in 1843.

The famous "Great Eastern" is rather popularly described, with some mention of its demon-

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stration of Scott Russell's "wave-line" and "longitudinal-frame" principles. No adequate idea is given, however, of just what these features may be. Sir William White's vindication of her designer, Isonbard Brunel, is appended to the description.

The "Mauretania" and "Lusitania" are also described more with reference to their stupendousness than to their actual engineering features and operation. Many British and German war vessels are included, but the American navy is dismissed with a couple of pictures and the statement that American designers were unhampered by the traditions of the other navies. Under miscellaneous vessels, are presented many notable examples of floating docks, train-ferries, ice breakers, yachts, etc.

A Biography of Thomas A. Edison.

EDISON: HIS LIFE AND INVENTIONS.—By Frank Lewis Dyer, General Counsel for the Edison Laboratory and Allied Interests and Thomas Commerford Martin, ex-President of the American Institute of Electrical Engineers. In two volumes. Illustrated. New York and London: Harper & Brothers. Cloth; 5½ × 8½ ins.; pp. 989. $4.00.

This is more than a mere biography; much more. It comes near being a history of the electrical industry. But it is history, however, and biography written in a most entertaining style. To say that the book is as interesting as a novel is too mild a compliment, when one recalls what things are served up to the public nowadays by the publishers of fiction. We believe that to the average engineer or business man this story of Edison will be found more interesting than any of the present day novels. Here is a case where truth is indeed more marvelous than fiction, and far better worth the attention of the reader.

It must be admitted that the task of the authors in making their book interesting was immensely aided by the fact that the subject of their biography is a person of such unusual interest. It is not merely because of his work as an inventor. There are hundreds and thousands of inventors who have performed feats of ingenuity as well worth chronicling as many of Mr. Edison's. It is because the man himself does things so differently from other men. His mistakes and failures and idiosyncracies are set forth with skilful fidelity by the biographers; and it is these lights and shades in the picture which they draw that makes it such an artistic success. They show us Edison the inventor working twenty hours a day on the details of some machine or process. They also show us Edison asking the Western Union Telegraph Co. to pay him $6,000 a year for 17 years for his telephone patents instead of the $100,000 in cash which the company had offered him! "I knew," said Edison, "that I would soon spend that money experimenting if I got it all at once, so I fixed it that I couldn't. I saved seventeen years of worry by this stroke."

About 1870, when only 23 years old, Edison made his first great success. He sold his patents on stock tickers to the Gold & Stock Telegraph Co. for $40,000 and invested the money in a machine shop in Newark, N. J. He did a large business but kept no books and never paid his notes at the bank until a messenger came around with the note and a protest charge of $1.25! With such methods of business, it was not strange that only a year or two later Edison confesses to being so short of money that he was paying a sheriff five dollars a day to withhold execution of a judgment against him in a suit to which he had paid no attention. In the nick of time, however, he sold his quadruplex telegraph to the Western Union for $30,000!

This is a fair sample of the early days of Edison's active work as an inventor. Nor is it unlike his later career, even though the work of later years has been on a far larger scale. He has made money by cartloads and lost it in the same wholesale way. The loss of it, however, means evidently far less to him than to the average man. In 1902, when General Electric stock was selling at 330, Mr. Edison in conversation asked what his own holdings of General Electric would have been worth if he had not parted with them. His companion after some figuring replied "over four million dollars." "Well," said Edison after a few seconds serious thought, as his face lighted up, "its all gone, but we had a hell of a good time spending it."

We give these few anecdotes out of the many with which the book abounds to show the interest in the book as a picture of the inventor's personality. A review in this journal, however, must give credit also to the value of the book as a record of the development of electrical engineering from the time of Edison's boyhood, when telegraphy was the sole use to which electricity had been applied, down to his latest work on the storage battery.

Particularly valuable and interesting is the story of the early days of the electric lighting industry. It is probably true that Edison's work in this field has been his greatest contribution to electrical engineering development. It is a striking commentary on the uncertainties of the inventor's reward and the defects of our patent laws that Edison has never received any return from his inventions in this field. His losses and expenses in the defense of his patents fully equalled all his profits from their exploitation. His contributions to popular amusement, by his work in the development of the phonograph and kinetoscope have, we judge, brought him more profit than any of his inventions in the field of engineering.

For years, Mr. Edison has been a favorite illustration for the few who still decry technical education. They have pointed to him as an example of a self-made man and have urged that his genius would have been ruined had he been given an engineering training. We particularly commend this book to those who have held such a view. The biography shows how one-sided was the development of this self-educated wizard. Had Edison had the advantage of a technical education as a foundation, and particularly had he had some elementary instruction in business methods and principles, he might have avoided many errors and losses and won far greater success than he has achieved.

Nearly 200 pages of the second volume are devoted to an appendix in which is given a somewhat more technical description of each of Edison's principal inventions than that contained in the body of the book; and this is followed by a complete list of Edison's U. S. patents, from the electric vote recorder of 1868, No. 90,646, to a flying machine patent, No. 970,616, issued in August, 1908. There have been 1,239 patents issued to him by foreign countries.

The volumes are especially well worth the reading of engineering students and they should find a place in every college library.

British Notes on the Geology of Water-Supply.

THE GEOLOGY OF WATER-SUPPLY.—By Horace B. Woodward, F. R. S., F. G. S. Edited by Dr. E. J. Marr, F. R. S. New York: Longmans, Green & Co. London, England: Edward Arnold. Cloth; 5 × 7½ ins.; pp. 339; 44 illustrations in text, 2 appendixes. $2.50, net.

The series of books (Arnold's Geological Series) to which this one belongs, is, according to the preface, written by the editor of the series (Mr. J. E. Marr), designed first of all for students of economic geology, but he expresses his belief "that they will be found useful to the student of general geology, and also to miners, surveyors and others who are concerned with the practical applications of the science." The editor also states that:

> The author of the present work, late Assistant Director of the Geological Survey of England and Wales, has long been an authority on water-supply, having had many years' practical acquaintance with the principal water-bearing strata of the island, and with the requirements of engineers and well-sinkers in connection with the subject.

After a brief general introduction and some remarks on rainfall and "general geological considerations," the author takes up the distribution of rainfall, both surface and underground, and its subsequent appearance in rivers, underground channels, springs and wells. After using about 140 pages of space in this way, some 80 pages are devoted to the "Water-Bearing Strata of Britain with a Special Reference to England." There then follow a chapter of 20 pages, on "Prospecting for Water," and a somewhat briefer chapter on miscellaneous supplies in out-of-the-way places of the world, after which some 20 pages are devoted to the quality of water and similar space to mineral waters. Three or four pages are used to speak of the proposed British National Water Board and some legal aspects of water supply. A brief glossary and a short bibliography, followed by an index, complete the volume.

The book having been written primarily for British students and geologists, and more particularly with reference to conditions in England, can hardly be expected to make much of an appeal to any class of readers outside Great Britain, and, perhaps, the Colonies. British water-supply engineers may find it convenient to have the geological information which the volume contains brought together in a handy volume and correlated with water-supply matters. Engineers outside of Great Britain will find little in the book to instruct them, although considerable of general interest. For the British engineer, the volume might have been made much more useful had the author collaborated with a good water-supply engineer, not only as regards the ordinary engineering phases of the subject, but also and particularly on some of the sanitary aspects of water-supplies.

It is interesting to note that the author makes frequent reference to a few American publications, but confines himself to two or three water-supply and irrigation papers of the U. S. Geological Survey published in 1902 and 1903. Whether he found nothing in the scores of later papers from the same source, or considered them of no value for his purpose, he does not state.

A Dictionary for the Iron Industry.

IRON AND STEEL.—(A Pocket Encyclopedia) Including Allied Industries and Sciences. By Hugh P. Tiemann, B. S., A. M., with an Introduction by Henry Marion Howe. New York and London, England: McGraw-Hill Book Co. Flexible morocco; 4 × 7 ins. pp. 354; 43 illustrations in text. $3, net.

Mr. Tiemann has provided here a remarkably useful little manual. In dictionary form he defines all words belonging to the sciences and arts of iron manufacture, including trade and shop terms and slang as well as the scientific or "literary" words. He gives only a brief definition where this suffices, and where more is needed he supplies a short essay, often covering in two pages a large field on which numerous books have been written. Through these cyclopedia articles the book becomes a pocket manual of the iron industry, something not before in existence; as such it is bound to appeal to nearly every person directly concerned in the production, sale or use of iron. Besides this it serves as a translating dictionary for converting from shop terms to laboratory terms, and in view of the great extent and specialization of both these lingos there is ample opportunity for the book to prove useful as a medium of exchange. Prof. H. M. Howe supplies an appreciative introduction.

British Essays on Road Engineering.

PRACTICAL ROAD ENGINEERING FOR THE NEW TRAFFIC REQUIREMENTS.—Compiled from the Special "Roads" Issues of "The Surveyor and Municipal and County Engineer." By H. Percy Boulnois, M. Inst. C. E., F. R. San. I., etc. London, England: The St. Bride's Press, Ltd. Cloth; 8½ × 11½ ins.; pp. 140; numerous illustrations in text. 5s., net; American price, $2, postage extra.

We have here a reprint in classified form of a large number of useful and suggestive papers which originally appeared in our London contemporary "The Surveyor and Municipal and County Engineer." A brief introduction by the compiler gives a general idea of the main contents of each section of the book, together with a bit of critical comment.

Of the eleven sections of the book, the first, on "Construction and General Maintenance," contains eleven papers or articles, and the second, on "Surface Construction and Treatment," contains eight articles. The other sections deal successively with "Street Dimensions," "Concave Roads," "Tramway Tracks," "Standardization," "Roads and Vehicles," "Administration," "Road

Engineers' Experiences of Tar Treatment," "A Glossary of Proprietary Road Methods, Materials and Appliances" and "Premium Papers." There are generally one to three authors for Sections III to VIII., but six authors contributed to the section on "Administration." The section detailing "Experiences" comprises brief statements from "a number of engineers and surveyors throughout the United Kingdom, giving their personal experiences and methods of treating roads with tar and the results." The prize essays in the final section are short, each generally being the equivalent of about a column of Engineering News. One of the topics for which premiums were offered by the "Surveyor" was "The Practical Application and Value of the Tests of Road-Making Stones, made by Mr. E. J. Lovegrove and Mr. Logan Waller Page."

In view of the great present interest in the subject of road construction and dust prevention, the "Surveyor" has rendered a public service in bringing together in convenient form so many papers on the subjects indicated. It may be added that some of the papers or articles are very brief, and that nearly all of them appear to have been written by borough or county engineers in actual charge of road construction and maintenance in some portion of Great Britain.

DEUTSCHER KALENDER FUR ELEKTROTECHNIKER. Begründet von F. Uppenborn. In neuer Bearbeitung herausgegeben von G. Dettmar, Generalsekretär des Verbandes Deutscher Elektrotechniker, Berlin. In zwei Teilen. Achtundzwanzigster Jahrgang, 1911. Munich and Berlin: R. Oldenbourg. Erster Teil: Flexible morocco; 4 × 6¼ ins.; pp. 857; 1 plate and 245 text figures. Zweiter Teil: Paper; pp. 345; 144 text figures. 5 marks; American price, $2, postage extra.

This year-book of electrical science and industry is now in its 28th year. There has been considerable revision and improvement over the preceding issue, but no general change and no special innovation. The work is an excellent electrical pocket-book. Its commercial details, of course, are primarily European.

Poor's Manual for 1910.

POOR'S MANUAL OF THE RAILROADS OF THE UNITED STATES, 1910.—Street Railway and Traction Companies. Forty-third annual number. New York: Poor's Railroad Manual Co. Cloth; 6¼ × 9 ins.; pp. 2710; 55 maps. $10, net.

This is the 43d annual issue of this invaluable statistical publication. In former years the "Manual," by reason of its wide use as a reference book by financiers, included returns from industrial corporations as well as railways. The volume has now become so bulky, however, that all such corporations are omitted and steam and street railways alone are included.

The introduction contains the usual statistical tables of railway earnings and expenses which are in some respects more convenient for reference than the statistical annual of the Interstate Commerce Commission.

The labor and expense involved in the compilation and publication of this work and maintaining its high standard of accuracy are greater than in almost any other annual published by private enterprise. Its editors and publishers deserve high praise for their work.

Forest Mensuration for the Woodsmen.

THE WOODSMAN'S HANDBOOK.—By Henry Graves, Forester, and E. A. Ziegler, Director, Pennsylvania State Forest Academy. Revised and Enlarged. (U. S. Department of Agriculture, Forest Service—Bulletin 36.) Washington: Government Printing Office. Pub. Doc. Pp. 208; 16 figures in text; 75 tables.

The Forest Service has here brought together a useful "collection of tables and rules of practical use to lumbermen, foresters and others interested in the management of wood and timber," selected for its "practical value to American woodsmen." The most useful of the various log rules for board measure are briefly described, as also the rules and practice of so-called standard measure. Log scaling, cubic measure, cord measure and timber estimating are taken up. Timber estimating includes various methods of determining approximately the aggregate volume of timber stands. There is a section on growth of trees by timber height and volume, and also

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one describing "special instruments useful to a woodsman." An appendix contains a number of volume tables for different kinds of trees and geographical groups; also growth tables, yield tables and a number of miscellaneous tables, the latter including areas of circles in square feet, contents of 1-in. boards in board feet, compound interest and annuity tables. Both the size and contents of the volume make it in truth what its name implies—a handbook for the woodsman.

The Public Domain and Democracy.

THE PUBLIC DOMAIN AND DEMOCRACY.—A Study of Social, Economic and Political Problems in the United States in Relation to Western Development. Vol. XXXVIII., No. 1. [Whole Number 100.] By Robert Tudor Hill, Ph. D., Sometime University Fellow in Sociology. Edited by the Faculty of Political Science of Columbia University. New York: Columbia University (Longmans, Green & Co., Agents.) London, England: P. S. King & Son. Paper; 6¼ × 9¾ ins.; pp. 253. $2, net; cloth-bound, 50 cts. additional.

The treatment of the subject chosen by this author has resulted in an interesting discussion of problems and facts connected with the settlement of the West in some of their many bearings upon the successes and failures of democratic institutions. The general aim of the author may be briefly expressed in the following quotation from the preface:

> Briefly then, this is offered as a study of population movements of the country, and the opening, occupation and exploitation of the Public Domain in relation to the perpetuation and development of the social, economic and political democratic ideal in America; to the promotion of ideals of personal liberty and freedom; and to the problems which the conflict of these ideals produce. . . . . The study is offered as a partial analysis of the actual operation of democracy in relation to the growth of the individualistic ideal, and as a presentation of certain developments which have occurred, due, in large part, to natural conditions during the past century in union with certain apparently fundamental traits—at least up to date—in human nature.

The author first discuses "The Western Movement" largely in terms of growth and character of population. He then reviews the public land policies of the United States in relation to the public domain, and shows many of the abuses which have been one of the most notable features of transferring the public lands of the United States to private ownership. There then follow in succession three interesting chapters entitled "Western Optimism;" "Democracy and Equality in the West," and "Democracy in Western Political Life." Having brought out clearly and forcibly the extent to which optimism, democracy and equality have prevailed on the frontier, the author next takes up in a more abstract way a general discussion of "Democracy and Individualism." Having set forth, as well as perhaps might be expected in less than 20 pages, the somewhat complicated relations between democracy and individualism, two chapters are then given up to "Individualism and the Public Domain." To a certain extent, these chapters are an amplified restatement of the general survey of public land policies and practices of and in the United States presented in the early part of the monograph. The discussion is centered around the sub-topics: Soil and Forest Exploitation, Land Speculation, Mines and Mining, Fencing of Public Lands, Water Power and Water Power Sites, Survey Frauds, Swamp Lands, Railroad Land Grants, and Homesteading and Commutation.

The final chapter, of some 30 pages, is entitled "A Social Democracy—Survey and Conclusions." Here and elsewhere Mr. Hill shows how the somewhat extreme types of democracy and individualism common to the Western frontier have failed to secure to the people the benefits that might be expected to arise therefrom. This has been largely due to the slow development and enforcement of the principle of social control or some public means of harmonizing an extreme type of individualism with the welfare of society as a whole. It is not until the last page but one of the book that the author expresses, and then but as a part of a single sentence, the idea that democracy can only succeed in the West or elsewhere

> through an informed body politic, a body not only appreciative of the actual conditions it faces, but also cognizant of means to secure its social will, and able to do so by law and social opinion.

We may add that it is hardly to be expected that the people engaged in the subjection of the crude and hitherto untamed forces of nature, while at the same time pushing forward a frontier line 2,000 miles in extent, would have much opportunity to inform themselves on the history and the then present status of democracy and the best means to harmonize the interests of the individual and of society at large. More recent years of comparative leisure for both the gaining of information and reflection thereon have given the people of the Far West an opportunity to introduce methods designed to place control of governmental agencies in the hands of the people instead of a few self-seeking individuals and large corporations. Such great movements as those looking to the adoption of the initiative, the referendum and home rule for cities are almost overlooked by Mr. Hill in his discussion. This is perhaps in part due to the fact that some of these movements pertain rather to urban than to rural districts.

The study as a whole is not only interesting, as we have already stated, but to a considerable degree instructive and suggestive. It might have been made more instructive had the author given more attention to various quite recent developments in the West, and particularly to some of the efforts made by the individual states to protect the rights and interests of individuals as against speculators and grasping corporations. Broadly speaking, Mr. Hill has quite overlooked state action in all these matters. This also is very likely due to the fact that the discussion relates more particularly to the public domain, but it would have been interesting to have shown what happened after the states assumed the place of the nation in looking after the interests of the people of the several states.

Biographical Sketches of Seventeen Scientists

LEADING AMERICAN MEN OF SCIENCE.—Edited by David Starr Jordan, President of Stanford University. New York: Henry Holt & Co. Cloth; 5¼ × 8 ins.; pp. 471; 17 portraits. $1.75, net.

The task of selecting a few names from a century of scientific endeavor, so that those selected will be representative of the highest ideas in the science to which they were devoted is at best a difficult one and the editor of this latest of the "Biographies of Leading Americans" series is to be complimented on his judgment. From that

> poor New England boy who became, in England, cavalry colonel, Under Secretary of State and Sir Benjamin Thompson; in Bavaria, Count Rumford of the Holy Roman Empire, Privy Councilor, Minister of War, Chief of Police and Chamberlain to the Elector Palatine; in Paris husband of a *femme savant* of a French Salon; and who died alone and friendless in the city where he had been eulogized by Napoleon

to Simon Newcomb, the astronomer, whose death is so recent as to be recalled by all, the list of biographies comprises seventeen of the leaders of natural science in America; four physicists, three zoologists, two ornithologists, two geologists, two paleontologists and a chemist, an anatomist, a botanist and an astronomer. In nearly every case the biography is written by a disciple of the subject, or at least by one who has achieved some distinction in the line he followed.

VERSUCHE MIT EISENBETON SAULEN.—Ausgeführt im Königlichen Materialprüfungs-Amt zu Gross-Lichterfelde-West. Deutscher Ausschuss für Eisenbeton. Reihe I und II. By Prof. M. Rudeloff. Berlin: Wilhelm Ernst & Sohn. Paper; 7½ × 11 ins.; pp. 118; 72 illustrations in text and 27 tables. 6 marks; American price, $2.40.

Unlike similar bodies nearer home, we find the German Committee on Reinforced Concrete publishing a report of experiments made at its direction to give a basis for reporting on the subject. We have heard it asserted that if a commitee of this kind undertakes experiments, there is no reason why it should publish the experiments. The above pamphlet evidences another view. The tests reported cover nearly 100 columns with 15 different arrangements of reinforcing. The chief object was the determination of best form of transverse reinforcement. Some of the tests include measurement of [illegible]ging, yielding a ratio of longitudinal to lateral deformation ranging between 2.0 and 2.7.

DER STRASSENBAU.—Zeitschrift für Tiefbau, Staats und Gemeindewesen. Organ für Strassenbau, Entwässerung und Städtereinigung. Halle a. S., Germany. Published on the 1st, 10th and 20th of each month. No. 1, Oct. 1, 1910.

This new journal starts its existence with a formidable council of advisers and collaborators. Its field appears to be municipal work generally, since the subtitle mentions streets, sewerage and cleaning (including disposal, presumably). Street or road construction is made the main issue, however, and on this account the new venture stands virtually alone. The first issue contains articles (or first instalments) on Street Grades, Pavement Foundations, Fruit Trees for Parked Streets, The Sewerage of Karlsruhe, Comparative Wear of Clay and Concrete Sewer Pipes, The Brussels Road Congress, Improved Roads of Bulgaria, Street Cleaning and Sprinkling in the large cities of England, Scotland and Ireland, Village Water Supplies, and Slag from Refuse Furnaces.

ELEMENTARY CRYSTALLOGRAPHY.—Being Part I. of General Mineralogy. By W. S. Bayley, Ph. D., Associate Professor of Mineralogy and Economic Geology, University of Illinois. New York and London, England: McGraw-Hill Book Co. Cloth; 6¼ × 9½ ins.; pp. 241; 311 text illustrations. $2, net.

While this work deals with a subject which engineers in most cases try to forget as soon as possible after completing their college course, yet it may be mentioned as commendable for simplicity and reasonable thoroughness. Parts II. and III., comprising the last 50 pages of the book, are likely to be specially interesting, as their theme, the physical and chemical orientation in crystals, is relatively closer to the engineer's field of thought than the geometrical classification of crystal forms with which the bulk of the volume is occupied.

LANDSCAPE ARCHITECTURE.—Official Organ of the American Society of Landscape Architects. Edited by Charles Downing Lay, Henry Vincent Hubbard and Robert Wheelwright. Harrisburg, Pa.: The Editors. Stiff paper; 8½ × 11 ins.; pp. 52. 50 cts. per copy; per year, $2.

A few well presented articles by eminent authorities make up the greater part of the initial issue of this new journal. Apparently, it will cover some of the same topics as are being given consideration in the "Town Planning Review," noted in our issue of Oct. 13. Like the British journal just named, the new American publication is a quarterly. It is, however, designed primarily for landscape architects, rather than for the many and varied classes of people who are interested in town planning. The number before us contains, among other things, an article on "Street Traffic Studies," by Frederick Law Olmsted, and one on "Planting at the Alaska-Yukon-Pacific Exposition," by James F. Dawson. As might be expected, the new journal is well made from the standpoint of the printer and half-tone engraver.

THE COMMERCIAL HICKORIES.—U. S. Department of Agriculture, Forest Service, Bulletin 80. By A. T. Brisen and J. A. Newlin. Washington, D. C.: Pub. Doc. Paper; 6 × 9 ins.; pp. 64; 6 plates and 17 text figures.

Probably most persons know that black walnut is the most valuable of the important North American woods, but few realize that hickory stands next. As hickory does not grow in forests and the lumber is always cut on a small scale, it is very difficult to find about what the real annual conumption is. According to this bulletin it is estimated at 450 million ft., board measure. That which is not used for fuel is almost exclusively employed in the manufacture of wheel spokes, rims, poles, shafts, singletrees and other carriage parts, for handles of axes, hammers, picks and other tools. For all of these uses it has practically no substitute. This booklet calls attention to the rapidly diminishing supply of hickory timber and is chiefly devoted to a treatise on the tree, its forms, and how to reproduce it. Considerable space is also given to the character and mechanical properties of the wood.

A Study of Conflicting Health Agencies in Great Britain.

THE STATE AND THE DOCTOR.—By Sidney and Beatrice Webb. London and New York: Longmans, Green & Co. Cloth; 6 x 9 ins.; pp. 276. $2, net.

Those indefatigable students of social reform, Sydney and Beatrice Webb, have added another valuable and interesting volume to their lengthening shelf of social studies. The present work is an outgrowth of a special investigation made for the recent Royal Commission on the Poor Law. The results of that investigation have been brought up-to-date and some explanations and conclusions added.

In brief, the volume before us deals with what the authors describe as "the tangle" which results from various overlapping agencies engaged in looking after the sick. The two chief of these agencies are found in the medical services of the Poor Law and the Public Health departments. In addition, some of the municipalities maintain hospitals which come under neither of the two departments named. Two distinctive features of the legally separate medical services named are that the one connected with the Poor Law has to do only with the destitute sick and cannot engage at all in work designed to prevent sickness, while the Public Health Medical Service takes all discoverable cases of patients suffering from communicable diseases and has as one of its chief aims and ambitions the prevention of diseases.

After a brief historical introduction in which the authors trace the development of both of the medical services named during the nineteenth century, there follow chapters on the treatment of the sick in their homes and in institutions under the English Poor Law. The work of the district medical officers and the general characteristics of their patients are here described, as also the English workhouse, rural and urban, and the infirmary or hospital connected therewith. A chapter is devoted to voluntary agencies for treating the sick, including hospitals, dispensaries and medical clubs. The treatment of the sick by the public health authorities is next considered, including hospitals, disinfection, supply of medicine and antitoxin, the medical care of school children, the supervision of birth and infancy and health visitors.

The two main fields of medical health work having been reviewed, the authors devote one chapter to "The Need for Unified Medical Health Service," and another to "Straightening out the Tangle." The plan proposed by the authors is to consolidate all the medical work done by the Poor Law and Health Department services under the latter, but with a system of graded fees diminishing as the income or wages of those served diminish and with no charge for all persons whose income is below a very small minimum. The grading of fees would be vested in a Registrar of Public Assistance.

The scheme of fees for medical service (including care in hospital, etc.), is designed to lessen the burden upon taxation due to the proposed new medical health service. Another and important object of the fees is to prevent abuse of the proposed health service without anything whatever of the stigma which for many years past has attached to aid given by the Poor Law authorities. Under the Poor Law, as nearly everyone knows, a person must be destitute in order to secure relief, and application for and acceptance of relief makes a person a pauper. Obviously, in the interests of public health there should be no deterrent to securing prompt medical aid where and when needed.

It should be understood that in Great Britain both the Poor Law and Public Health departments are under the administrative control of the Local Government Board; but most unfortunately two or more divisions of the board named supervise the local poor law and health service, and the divisions, as a rule, are in no way coordinated.

The authors of this book have a broad conception of the functions of a state or national public health service. They would have such a service include a wide class of preventable diseases and sickness as well as the ever-enlarging class of

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communicable diseases. At the same time they would avoid the placing of an undue burden upon the municipal treasury, both by the system of fees already mentioned and by Parliamentary Grants-in-Aid. They would also try to make sure, so far as possible, that everyone needing the benefits of preventive or state medicine should receive proper attention at the proper time, to the end that the health of the individual and the nation be conserved.

We have omitted to state that the public health medical service would not be forced upon anyone under the plan proposed by our authors. Anyone desiring to choose his or her own doctor from among private practitioners would be free to do so, but as we understand it the aim would be to ensure medical treatment when necessary. Presumably the same general rule would apply to treatment in hospitals.

The book possesses unusual interest to anyone at all concerned in the public health problems of to-day, either in this or other lands. It should be particularly suggestive to those who are now conducting a vigorous campaign for a national department or bureau of health in the United States.

Water-Supply and Typhoid and General Death Rates.

ON THE MILLS-REINCKE PHENOMENON AND HAZEN'S THEOREM CONCERNING THE DECREASE OF MORTALITY FROM DISEASES OTHER THAN TYPHOID FEVER FOLLOWING THE PURIFICATION OF PUBLIC WATER SUPPLIES.—By W. T. Sedgwick, Professor of Biology, Massachusetts Institute of Technology, Boston, Mass., and J. S. MacNutt, Health Officer, Orange, N. J. Reprinted from "The Journal of Infectious Diseases" [Chicago]. Paper; 6¾ × 9½ ins.; 13 charts and 20 tables.

Virtually simultaneous but quite independent conclusions to the effect that improvements in public water-supplies were accompanied or immediately followed by reductions in the general as well as in the typhoid death rate, were reached some 17 years ago by Mr. Hiram F. Mills, at Lawrence, Mass., long-time engineer member of the Massachusetts State Board of Health, and Dr. J. J. Reincke, Health Officer of Hamburg, Germany. The observations in each case related to improvements in the polluted water-supplies of Lawrence and Hamburg, respectively. In the course of a paper presented at the International Engineering Congress held at the St. Louis Exposition in 1904, Mr. Allen Hazen, M. Am. Soc. C. E., put this general conclusion in a more specific form in the following sentence:

> Where one death from typhoid fever has been avoided by the use of better water, a certain number of deaths, probably two or three, from other causes have been avoided.

The authors of this study have named the conclusions reached by Messrs. Mills and Reincke, the "Mills-Reincke Phenomenon," and have applied the term "Hazen's Theorem" to the sentence just quoted. In order to verify both, and particularly "Hazen's Theorem," the authors have rendered a valuable service by making detailed studies of the mortality statistics of not only Lawrence and Hamburg but also Lowell, Mass.; Manchester, N. H.; Albany, Binghamton and Watertown, N. Y. Lowell was taken up for comparison with Lawrence, where various local conditions were in many respects very similar, while Manchester was taken as a city with abnormal conditions similar to those of Lawrence and Lowell, except that Manchester was normal in having a relatively pure water-supply. The three New York cities named were added for verification and side-light effect. Each has had impure water, followed by improvement through purification plants. At Watertown, the expected improvement in typhoid and general death rates did not follow the introduction of water purification, but this is explained through the probable inefficiency of the filtration plant.

The net result of the study made by Professor Sedgwick and Mr. MacNutt is verification of both the "Mills-Reincke Phenomena," and the "Hazen Theorem," together with an expression of the latter in more specific terms. We quote a paragraph as follows:

> Mr. Hazen's quantitatnve expression for the Mills-Reincke Phenomenon, when applied to the cities which we have studied (with the exception of Watertown), appears sound and conservative. It seems likely, however, that it will be impossible in the future to confine the relation even within the broad numerical limits suggested by Mr. Hazen. In fact, Mr. Hazen himself is very careful in this particular, as will be seen by a reference to his original statement. It is probable that the pollution of a public water supply may consist, at one time or in one place, of much typhoidal infection mingled with comparatively little sewage, or, on the other hand, of much sewage only lightly charged with typhoid fever germs. In the former case the reduction in typhoid fever might be out of all proportion to the reduction in general death-rate, and in the latter case vice versa. For Hamburg, we have pointed out above, that the saving in typhoid mortality was slight in comparison with the saving of mortality in other diseases, combined, i. e., roughly only about 1 to 16. In the other cities studied we find ratios widely different from this, e. g., at Lawrence, 1 to 4.4, at Lowell 1 to 6.0, in Albany, about 1 to 4.1 (uncorrected), and in Binghamton only about 1 to 1.5 (uncorrected). It is clear, therefore, that Hazen's theorem is merely a convenient formula rather than a precise mathematical expression.

The authors further state that one of the most remarkable and "surprising results of our study will probably be the disclosure of the remarkable relation subsisting between polluted water and infant mortality." A similar but less marked relation seems to exist as regards diarrhea and gastro-intestinal disorders. As to tuberculosis the authors state "that the evidence, though less striking, is interesting and suggestive." There also seems to be a marked relation in the decline of pneumonia and bronchitis, following the substitution of pure for impure water. As to the explanation of this interesting and very suggestive phenomenon, the authors observe:

> Finally, the question naturally arises, to what is the decline of mortality observed in the Mills-Reincke phenomenon for diseases other than typhoid fever due? A little reflection will show that increase of vital resistance, due perhaps, to the use of a purer drinking water, might produce this effect, while, on the other hand, the same results might be reached by an exclusion of disease germs formerly present and working upon the bodies of their victims. Or, as a third possibility, the phenomenon might be due to a combination and co-operation of thees two factors.
>
> It is interesting to observe that Mr. Mills in his writings upon this subject, without especially committing himself to either hypothesis, has apparently had in mind chiefly an increase of vital resistance, while Dr. Reincke has expressed himself rather as looking to the removal of disease germs previously present.
>
> The facts at present in our possession do not allow us to settle the question beyond peradventure, and this problem, like many others raised throughout our paper, requires further elucidation.

The authors wisely desisted from going far afield with their studies, feeling that the most conclusive results could be obtained only where conditions made intensive studies possible. They were enabled to go somewhat deeply into Hamburg conditions through the very careful and detailed original investigations made by Dr. Reincke, while in the case of Lawrence, Lowell and Manchester, not only was detailed information readily available but much of it has been given very careful and close attention for years past by Professor Sedgwick. Health officers in the various cities of the country might very properly give careful attention to this valuable essay and follow out the same general lines, each for his own city, with the idea of drawing conclusions, which they could put into practical effect in connection with their daily work.

EXPLOITATION DES MINES.—La Taille et les Voies Contigües a la Taille. By L. Crussard, Ingénieur au Corps des Mines, Professeur à l'Ecole Nationale des Mines de Saint-Etienne. Paris, France: Octave Doin & Sons, (8, Place de L'Odeon). Cloth; 4¾ × 7¼ ins.; pp. 393; 190 text figures. 5 francs; American price, $1.50.

The practice of Continental Europe, and more particularly France, in the methods of mine working is very well set forth in this latest volume of the extensive "Scientific Encyclopedia" published by Doin & Sons. The matter of shafts is not taken up but the various methods of side cutting, stoping and general gallery construction are gone into most thoroughly.

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The Gloversville Sewage-Purification Experiments.

SEWAGE PURIFICATION EXPERIMENTS AND SEWAGE DISPOSAL.—Report to the Common Council of the City of Gloversville, N. Y., by Harrison P. Eddy, Consulting Engineer, [Boston, Mass.], and Morrell Vrooman, City Engineer, Aug. 7 ,1909. Gloversville, N. Y.: City Doc. Paper; 6¼ × 9¼ ins.; pp. 330; 1 folding plate (plan); 10 diagrams; 66 tables in text; 19 appendixes (tables).

An important addition has been made to the long series of American reports on sewage-purification experiments by this contribution of Messrs. Eddy and Vrooman, giving the methods employed and the results obtained in sewage-purification studies at Gloversville, N. Y. The experiments and report are all the more notable because they were made in behalf of a community with only some 20,000 population.

Gloversville is the center of the glove industry of the United States. There are 27 tanneries in the city, treating glove and other fine grades of leather, and, of these, 24 discharge their wastes into Cayadutta Creek, at present through intercepting sewers built by the city. Shortly before the date of these experiments, settling tanks had been built at most or all of the tanneries.

Litigation against the city and some of the tanneries has been in progress more or less continuously since 1899. Altogether, the city has defended 70 suits which have resulted in 23 injunctions against the pollution of the creek, and in a total legal damage expense of $25,000. It should be added that the creek mentioned is so small that in dry weather it affords a sewage dilution of only 3 to 1, and at times not that.

The experiments here described extended over a period of about six months in 1908-9. Although the report is dated August, 1909, it has but recently been distributed in printed form. The Chief Chemist at the experiment station was Mr. Harry B. Hommon, who had been previously connected with the sewage experiments at Columbus, Ohio, and Waterbury, Conn.

The experimental plant included a laboratory, power plant, coarse screens and grit chamber; a septic and a settling tank, each 8 x 32 ft. in plan, with an 8-ft. depth of sewage, and a capacity of about 15,300 gals.; four sprinkling filters of .003-acre, each enclosed in a wooden cylinder, and having depths of filtering material of 10, 7, 5 and 5 ft., respectively, and each being served by single fixed nozzle of the Columbus type, operating continuously under a constant head, and delivering sewage into beds of 1½ to 2-in. limestone, resting on a false bottom covered with 6-in. field stone; and, finally, two small settling basins and two intermittent sand filters. In November a frame building was erected over the tanks and all the filters except one of the sprinkling filters.

About 125 pages of the report before us are occupied with descriptions of the conditions prevailing at Gloversville and the experimental plant, followed by a detailed review of the experiments, the latter including summary tables. The balance of the report consists of a number of appendixes, giving chemical analyses and details, together with temperature and other meteorological observations.

It hardly need be said that the report is of unusual interest, in view of the peculiar character of the sewage treated, which, presumably, unless in degree of dilution, is similar to that of Yeovil, England, at which place one of the earliest septic tank and contact bed installations may be seen. The effluent at Yeovil, it may be added, is passed over land, in accordance with the hard and fast rules of the Local Government Board which prevailed at the time the plant was installed.

At Gloversville "three independent and complete methods" of treatment were investigated: (1) septic processes or sedimentation followed by sprinkling filters and then by sedimentation; (2) the same, with the addition of intermittent sand filtration; (3) intermittent sand filtration of crude sewage. The final recommendations involve the construction of a plant, including sedimentation, sprinkling filters, either 7 or 5 ft. deep, working at the rate of 1,000,000 gals. per acre per day, secondary sedimentation basins of such a capac-

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ity as to reduce the suspended solids to 30 parts per 1,000,000, and in case 5-ft. sprinkling filters are used, final treatment on sand filters at the rate of 1,000,000 gals. per day. The choice between a 5 and 7-ft. depth for sprinkling filters will depend upon the estimated cost of first construction, as well as that of operation, and cannot be reached until further studies relating to design have been made. If reasonably economical, the filters 5 ft. in depth followed by sedimentation and intermittent filtration through sand, will probably yield the most satisfactory effluent.

Rubber and Its Testing.

DER KAUTSCHUK UND SEINE PRUEFUNG.—By Prof. Dr. F. W. Hinrichsen und Dipl. Ing. K. Memmler. Leipzig, Germany: S. Hirzel. Paper; 6 x 9 ins.; pp. 263; 64 text illustrations. 8 marks; American price, $3.20; postage extra.

Though rubber is used in enormous quantities, very little is known of its chemistry, its analysis is indefinite and as yet not even empirically standardized, and its mechanical testing is difficult and uncertain, or rather highly unsatisfactory. In these respects it has a unique position among constructive materials. However, a great amount of work has been done in the chemical study of rubber, and a fair amount in experiments on its mechanical properties. The authors of the present book bring together most of the reported results, and contribute statements of what has been done at the Berlin Materialprüfungsamt (Gross Lichterfelde), with which they are connected.

Leaving the chemical portion of the work out of notice (remarking only that the authors take definite attitude in the various differences of theory on constitution of latex and rubber, nature of vulcanization, etc.,) we find much of interest in the part dealing with mechanical tests. The primary objective is a satisfactory tensile test, and this requires a definitely reproducible form of test-piece, satisfactory provision for gripping the piece, and means for getting accurate readings of elongation in spite of the great changes of form of which rubber is capable. Rubber is available either in sheet form or in tape form, more commonly the former. To test the value of different shapes of test-piece, extensive tests were made at the Materialprüfungsamt of straight strips and strips with variously enlarged ends, all cut from sheets. It appeared that with the purer varieties of rubber fracture nearly always took place in the grips, because of the complex stress distribution in this region, and for all varieties the strengths obtained with different shapes showed such divergences as to indicate large, uncontrollable disturbing influences.

Concluding that a bar-shaped test-piece is unsuitable for rubber, the experimenters turned to the ring shape. Great difficulties were encountered in cutting a ring of fair rectangular section, in view of the compressible character of the material, but these were at last surmounted. For tensile tests of the rings, a machine was built by L. Schopper, containing two small pulleys over which the ring is placed, one pulley being attached to the pulling mechanism and the other to a weighing mechanism. The essential novelty of the machine lies in rotation of the pulleys, which is accomplished by a gear attached to the lower pulley, engaging a fixed rack and thereby rotating the pulley as it is drawn downward by the pulling device and stretches the rubber ring. This is intended to distribute the stretch over the whole length of the ring. The elongation of the sample is computed from the distance between the pulleys. Results of tests with this machine are given. The authors consider it a satisfactory solution of the problem.

For testing rubber in tape form no change from the straight form of test-piece is possible. Ordinary pulling machines, are, therefore, used. A departure is a design by A. Schob, in which the test strip is stretched by winding its ends up on two pulleys. The authors make no recommendation on this subject.

Compression tests of rubber also offer difficulties. On this subject, however, the authors have to go back to tests by Stévart (1871), and present the subject as still unworked.

Descriptions of various makes of rubber testing machines are given. Then the authors review successively the reported tests on the principal mechanical properties, including elastic modulus and hysteresis. They succeed well in showing how little reliable information exists on matters connected with the strength of rubber, and correspondingly how great a need exists for experimental investigation of the field.

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Municipal Statistics.

STATISTICS OF CITIES HAVING A POPULATION OF OVER 30,000: 1907.—Special Reports. Department of Commerce and Labor, Bureau of the Census, E. Dana Durand, Director. Washington, D. C.: Pub. Doc. Paper; 9 x 11½ ins.; pp. 548; 49 text tables, 71 general tables.

THE COST OF MUNICIPAL GOVERNMENT IN MASSACHUSETTS.—Second Annual Report on the Statistics of Municipal Finances, for Fiscal Years Ending Between Nov. 30, 1907, and April 6, 1908. Boston: Bureau of Statistics, Charles F. Gettemy, Director. Paper; 6 x 10 ins.; pp. lili + 323; tables.

With the statistics for 1907, the Bureau of the Census presents its sixth annual collection of statistical and other information for cities in the United States having a population of 30,000 and upwards. Most of the statistics given are financial in character, but in addition there are a considerable number of physical statistics. As time goes on, doubtless more of the latter will be added. It is highly desirable that this should be done, since the usefulness of the financial statistics alone is greatly limited. Even when reduced to a per capita basis, the financial statistics reveal comparatively little regarding governmental efficiency. To show efficiency, unit costs must be presented, and these can rarely be expressed on a per capita basis. The problem is beset with difficulties, since quality as well as quantity of service enters largely into unit costs, and to take account of quality in presenting unit costs of municipal services is a matter of great difficulty. All things considered, the Census Bureau has done well in centering the greater part of its earlier efforts on financial statistics, but it is to be hoped that it will speedily take up physical statistics in equal detail.

The present report opens with a brief introduction, in which there are set forth the objects of the Census investigation, differences in local governmental organizations and accounts, and needs for uniformity in (1) city accounts and reports, (2) methods of conducting municipal business and (3) a common accounting terminology. There is then repeated, with revisions, the text on accounting terminology presented in earlier bulletins.

Preceding the general tables, of which the report is largely made up, there is a brief review of "The Economic and Scientific Supervision of City Milk Supplies" specially prepared for this report by Mr. M. N. Baker, of the editorial staff

of this journal. This discussion is in part explanatory and in part supplementary to one of the main tables of the report. The discussion includes a digest of a considerable number of milk ordinances based on examination of the ordinances of about 65 cities. Following the discussion on city milk supplies, the general tables are described, including a section on "Organization and Methods of Police Departments" specially prepared by Mr. Richard Sylvester, Superintendent of the Police Force of Washington, D. C. This portion of the report includes the results of a study of the six tables of police statistics included in the report.

The tabular portion of the report includes 49 tables inserted in the text of the general discussion, and 71 general, or main, tables. The tables in the text are largely in the nature of brief summaries of the general tables. As already stated, most of the statistics are financial in character, dealing with ordinary payments, cash balances, indebtedness, assessed valuation, payments of outlays for permanent improvements, and more or less detailed statistics of transactions in various departments. There are also physical statistics for water and lighting plants, fire, police and health departments, sewers, garbage collection and disposal, streets, street cleaning and lighting, public parks, school and libraries, building permits, etc. The statistics of water-supply systems are more extensive than those of any of the other municipal public-service industries. They include year built or acquired by the city, length of mains, volume of water supplied, net cost and present value of system and outstanding indebtedness; also earnings and costs of service in considerable detail, including earnings, expenses of operation and interest expressed both on per capita and per-million-gallons-supplied basis.

An appendix of 30 pages, of relatively small type, is used to present a "Uniform System of Accounting for Water-Supply Enterprises," in the preparation of which service was rendered by Mr. Albert H. Wehr, Vice-President of the Baltimore County Water & Electric Co., Baltimore, Md. It will be remembered by some of our readers that at the last meeting of the American Water Works Association Mr. Wehr presented a pamphlet report of some 250 pages on water-works accounting.

As already indicated, the Census statistics are limited to cities of 30,000 population and over. The Massachusetts report noted above deals fully with all of the 33 cities and with the 65 towns in the state having a population of over 5,000. In addition, more or less information is given for some 200 small towns ranging in population from approximately 5,000 to less than 100.

The volume opens with a general discussion of the terminology of municipal finance and the condition of municipal accounts and reports, and the attitude of local officials on the subject throughout the state. In the course of this discussion a few summaries are given. The greater part of the volume is devoted to financial statistics under the general headings: Summary of Financial Transactions; Receipts from Revenue, Payments for Maintenance and Interest, Indebtedness and Cash Balances. These statistics are presented separately for cities and for towns of over 5,000 population. For the places under 5,000 population, receipts and payments under a few main divisions only are given.

It will be noticed that both the Census and Massachusetts reports reviewed in the foregoing paragraphs deal with statistics for the nominal year 1907. Figures so delayed before publication lose a considerable part of their value, but, as every one with experience knows, it is a difficult task to bring together and compile the statistics of widely scattered municipalities.

It should be added that the volume of Census statistics was published in full some months ago, and that we have information to the effect that in future more prompt appearance of the Census statistics may be expected.

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BOARD OF HEALTH OF THE STATE OF NEW JERSEY.—Annual Report for the Year 1909, and Report of the Bureau of Vital Statistics. Paterson, N. J.: Pub. Doc. Cloth; 6 x 9 ins.; pp. 526; numerous tables and text illustrations.

BULLETINS OF THE ENGINEERING EXPERIMENT STATION, UNIVERSITY OF ILLINOIS.—In two volumes. Urbana, Ill.: The University. Cloth; 5¾ x 9 ins.; numerous text illustrations and tables.
Vol. IV.: Bulletins 27-34, Circular 3. September, 1908—May, 1909.
Vol. V.: Bulletins 35-42. July, 1909—December, 1909.

BULLETINS U. S. GEOLOGICAL SURVEY.—Geo. Otis Smith, Director. Washington, D. C.: Pub. Doc. Paper; 5¾ x 9 ins.
No. 430: Contributions to Economic Geology (Short Papers and Preliminary Reports) 1909. Part I.—Metals and Nonmetals Except Fuels. By C. W. Hayes, and Waldemar Lindgren, Geologists in Charge. Pp. 653; 14 folding plates (13 maps) and 75 text figures.
No. 431-A: Advance Chapter from Contributions to Economic Geology (Short Papers and Preliminary Reports), 1909. Part II.—Mineral Fuels. Petroleum and Natural Gas. By A. G. Leonard, H. E. Gregory, C. W. Washburne and Robert Anderson. Pp. 83; 3 plates (maps) and 1 text figure.
No. 440: Results of Triangulation and Primary Traverse for the years 1906, 1907 and 1908. By R. B. Marshall, Chief Geographer. Pp. 688; one folding plate (map); tables.

BULLETIN UNION COLLEGE, UNION UNIVERSITY.—Vol. III., No. 4, June, 1910. Limitations of Efficiency in Engineering Education (Address of George Fillmore Swain, L. L. D., M. Am. Soc. C. E., Professor of Civil Engineering, Harvard University, at the Opening of the General Engineering Building, Donated by Mr. Andrew Carnegie, April 28, 1910.) Schenectady, N. Y.: The University. Paper; 5½ x 8 ins.; pp. 28.

COMMISSION OF CONSERVATION, COMMITTEE ON PUBLIC HEALTH.—An Address on Pure Water and the Pollution of Waterways, by Chas. A. Hodgetts, M. D., Medical Adviser to the Committee on Public Health of the Commission of Conservation, before the Dominion Public Health Conference, Ottawa, Oct. 12, 1910. Ottawa, Canada: Copeland-Chatterson-Crain, Ltd. Paper; 6 x 9 ins.; pp. 54; 3 tables in text.

THE CONSERVATION OF WATER.—By John L. Mathews, Author of "Re-Making the Mississippi," etc. Boston, Mass.: Small, Maynard & Co. Cloth; 5½ x 8 ins.; pp. 289; 32 text illustrations. $2, net; postage, 15 cts.

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EQUILIBRE, CENTRAGE ET CLASSIFICATION DES AEROPLANES.—By R. Saulnier, Ingenieur des Arts et Manufactures. Paris, France: Librarie Aeronautique (32, Rue Madame). Cloth; 7½ x 11 ins.; pp. 58; 57 text figures. 3 francs; American price, 90 cts.

FINAL REPORT OF THE CHARLES RIVER BASIN COMMISSION.—June 30, 1910. (Hiram A. Miller, Chief Engineer.) Boston, Mass.: Pub. Doc. (No. 71). Paper; 5½ x 9¼ ins.; pp. 51; 12 illustrations; appendix.

GENERAL SPECIFICATIONS FOR CONCRETE BRIDGES.—By Wilbur J. Watson, Civil and Architectural Engineer. Second Edition. New York: Engineering News Publishing Co. Stiff paper; 8¼ x 11 ins.; pp. 66; tables. $1, net.

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MASTER CAR BUILDERS' ASSOCIATION.—Report of the Proceedings of the 44th Annual Convention, held at Atlantic City, N. J., June 15-17, 1910. Vol. 44. Chicago, Ill.: The Association (Jos. W. Taylor, Secy., 390 Old Colony Bldg.) Cloth; 6 x 9 ins.; pp. 853; numerous folding plates, text illustrations and tables.

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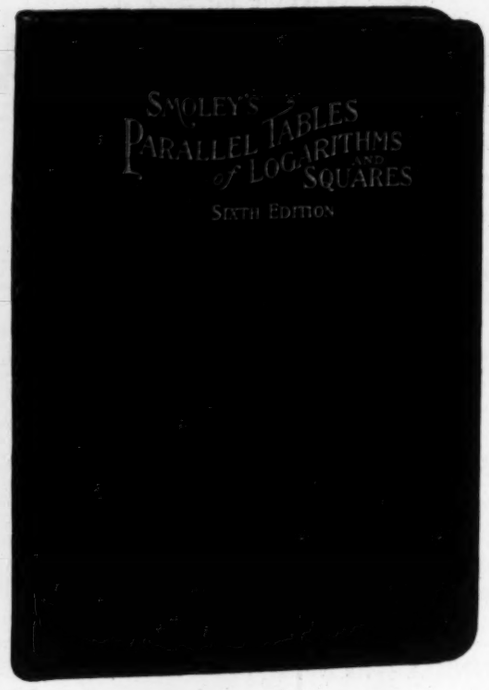

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